NAVAL POSTGRADUATE SCHOOL
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THESIS

THE IMPACT OF REGIONAL ECONOMIC
CONDITIONS ON MILITARY RECRUITING

by

Kimberly A. Murphy

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| Thesis Co-Advisors: | Michael Cook |
| | Stephen L. Mehay |

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Kimberly A. Murphy
Lieutenant, United States Navy
B.S., Bloomsburg University, 1983

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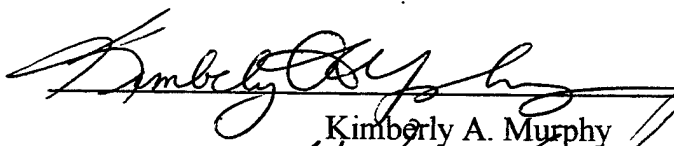
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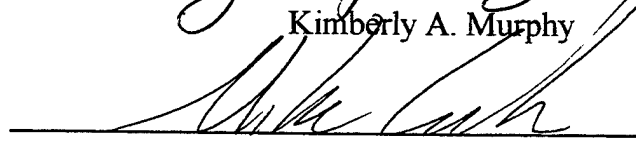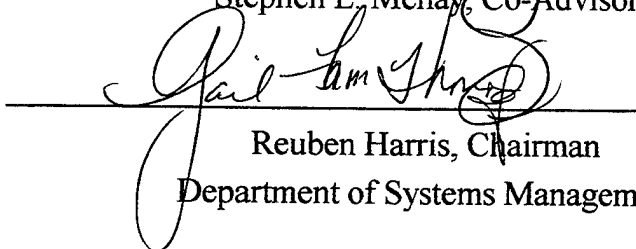
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Author: _____
Kimberly A. Murphy

Approved by: _____
Mike Cook, Co-Advisor

_____
Stephen L. Mehay, Co-Advisor

_____
Reuben Harris, Chairman
Department of Systems Management

ABSTRACT

The objective of this study is to examine the impact of county-level economic conditions on the recruiting market for the U.S. Armed Forces. This thesis establishes and analyzes the relationship between various demographic variables and recruiting at the county-level. Previous research in this area has dealt with data from various sources and at an aggregated level. It has looked across states, and across time periods, with some studies mixing data on the pre-AVF era with data from the AVF era. Much of the prior research examines a demand issue by looking at those who have already entered military service. This study examines data on individual military applicants. The data on applicants was provided by DMDC for a three-year period, 1993-1995. The individual applicant data is then aggregated to the county-level for analysis and county characteristics are used to explain the variation in applicants across counties. This study is the first to examine the applicant file.

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I. INTRODUCTION

A.   BACKGROUND

Every year hundreds of thousands of individuals apply to the military. They come from all walks of life and from every part of the country. Their reasons for seeking enlistment are varied. They can be driven by the economics of the employment situation in their area--unemployment in their area may be above the national average, or an individual may be lured by the education benefits the military offers. The reason for seeking enlistment may be something that is known only to the individual and may involve such unquantifiable factors as a strong sense of patriotism or an expectation placed on them by a family member. Furthermore, what may drive an individual to apply in one year may not be the same factor that would drive that same individual to apply in a different year. Operation Desert Storm was an example of this. Following this campaign, the military was riding a recruiting all time high. Some of the individuals who applied to the military may not have done so had it not been for this conflict.

The military places conditions on employment that are quite different from those in the private sector. The military only accepts individuals for enlistment up to the age of 35. Most applicants come from what is referred to as the prime recruiting market. This is defined as male youth ranging in age from 17-21 years of age. Many of these youth are first time entrants into the labor market. This is important because, unlike the private sector, the military is an internal labor market, with individuals only being accessed at the most junior pay levels. For individuals in the age group defined as the prime recruiting market, their

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reservation wage, or that wage offer below which jobs will be rejected, may not be as high as someone who has spent some time in the labor force and comes to a job with certain skills. Because the military does not access into pay grades other than the most junior pay grades, the military may not appeal to those who have experience in the civilian labor market.

Despite these large numbers of applicants, not everyone has what it takes to join the military. A strong sense of patriotism is not always enough. Tough academic, mental and physical standards must be met. Congress also limits the military in total members it may have on active duty. These numbers may not be exceeded and differ for each branch of the military.

The military of the 21st century will look different from the military of the 21st century. "By the year 2000, today's politically salient minority groups--blacks, Hispanics and Asians--will make up a slightly larger share of the total U.S. population than they do today."[1] By the year 2025, those persons 65 or older is expected to increase by 20 percent with the number of elderly people having nearly doubled. It is also expected that the family structure will have changed with more children being born to unmarried women, and having mothers employed outside the home. Women will constitute 63 percent of new entrants to the work force for the remainder of the century.[2]

Unemployment, wage rates, and employment must also be considered when

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[1]Eitelberg, Mark J. And Mehay, Stephen L., <u>Marching Toward the 21st Century</u>, 1994, pgs 67-79.

[2]Ibid, pgs 67-78.

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determining who will compose the military of the 21st century. During times of recession unemployment rates may vary between states. This would lead one to believe that when unemployment is high, applicants to the military should also be higher, which is in fact the case. Conversely, when unemployment is low, applicants to the military decreases, making it harder for the military to get the accessions it needs to meet end strength. Unemployed individuals may choose to migrate to a region where civilian job opportunities are more plentiful.

How these factors will influence the quality and quantity of people who apply to the military will pose unique challenges to lawmakers and military leaders. The combat exclusion law states that women will not hold positions in the military that will put them under direct fire of the enemy. If the presence of women in the work force continues to increase as predicted, this implies that more women will want to wear a military uniform, and that serious consideration to change the Combat Exclusion Law may be required. Minorities have traditionally scored lower than non minorities on the Armed Services Vocational Aptitude Battery (ASVAB) test. If this segment of the population continues to increase as predicted, then this has implications for entry standards. Entrance standards may need to be lowered to meet the end strength figures established by Congress. These are just some of the issues that will face lawmakers and military leaders into the 21st century and beyond.

B.   THEORY

It must first be understood what drives an individual to pursue the military as a source of employment instead of entering college or the civilian labor force. Economic

theory states that individuals will choose among employment options based on the desire to maximize their utility. As individuals attempt to maximize their utility, they will consider both the pecuniary and non pecuniary aspects of the job. Personal preferences will also play a major role in why an individual pursues one career over another. In essence, this 'choice' would be easy if all jobs were exactly alike and located in the same place. Some jobs require more education than others. Some jobs are by nature less hazardous than others, while some are located in clean offices instead of dirty factories. All jobs are not viewed the same by all people. Also, for any given wage level, only a certain number of individuals will be interested in a particular occupation.

Essentially, there are three choices available to individuals upon completion of high school: (1) enter college directly upon completion of high school, (2) pursue employment in the civilian labor force, and (3) enlist in the military. Individuals are motivated differently to pursue different careers. What might motivate one person to pursue the military may be the very reason why another person opposes joining the military. Those individuals who pursue college directly from high school must pass tough entrance exams and screening processes. They are also viewed as 'future oriented,' forgoing current wage earning opportunities until sometime in the future. At the completion of their college program, earnings for this group should be higher than if they entered the work force directly.

Theoretically, one would expect that as private employment and average civilian earnings became more attractive, the number of applicants to the military would decrease. In a healthy economy, the rate of labor force participation should increase as the number of

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jobs available increase. It will be easier to find employment for those who seek it, which should decrease the number of military applicants. Conversely, as the unemployment rate rises, and it becomes harder to find employment, one would expect the number of applicants to the military to increase. AFQT scores should also increase when unemployment rates are high. Poverty in an area should increase the number of applicants to the military in that particular area. Jobs are probably hard to come by, and the military could be viewed as an attractive alternative to being ranked among the poor. For this group of individuals, the salary being paid by the military should be higher than an individual's reservation wage.

The choice to enter the civilian labor force or join the military will differ from that of the college bound individual. Several employment opportunities face an individual. It is assumed that the person is fully informed as to the different aspects of a given job before a job decision is made. Pecuniary and non-pecuniary benefits must also be considered. The pecuniary aspect of job choice is centered on the individual's reservation wage. This is a cut-off wage, any job offer that falls below this wage should be rejected. Holding non-pecuniary benefits constant and only allowing wages to change, an individual should choose that job which pays the highest wage. Therefore, if an individual's choices are the civilian labor force or the military, the organization that pays the most should, based on theory, be the occupation the individual chooses.

C. OBJECTIVES

The quality and quantity of enlistments may vary with changes in economic conditions. Maintaining and attracting a high quality military force is expensive. With the projected change in demographics, it may become difficult for the military to maintain high

aptitude standards, even in poorer economic conditions. The type of youth attracted to the military of the 21ˢ century may differ from those attracted in the past. This will be one of the challenges facing recruiters as the military enters the 21ˢ century.

By analyzing data provided by the Defense Manpower Data Center on military applicants, and economic data provided by the Regional Economic Information Service, one should be able to ascertain if the military is attracting the proper mix of youth. This thesis uses this data to examine personal characteristics of youth who applied to the military in 1993, 1994, and 1995 by county. The micro-level data are aggregated to the county-level in order to develop a supply curve of youth interested in military enlistment.

D.   THE RESEARCH QUESTION

The primary research question will be, "How is the quantity and quality mix of youth attracted to the military affected by regional economic conditions?" Other areas of concern are to examine what makes an individual pursue the military as an alternative to civilian employment. The underlying choice may be intrinsic which is something known only to the individual, or it could be something that is prompted by the economic conditions of that individual's environment. Historically, during an economic recession the nation has provided the military with a bigger supply of manpower. Carrying this one step further, one can examine county-level data and the number of applicants to the military to see if there is any consistent patterns of recruiting supplies from hard-hit economic regions.

E.   SCOPE AND LIMITATIONS

The military is interested in the quality and quantity of its enlistees. As the military became more technologically oriented, the need for service members of higher aptitude

becomes stronger. Congress, the Department of Defense, and the military services have set targets for the amount of high quality youth they want to access. With a few exceptions, the military has met its accession goals, and has consistently done so since 1991. The scope of this thesis is to determine if the quality and quantity of youth interested in joining the military differs as local economic conditions change. This thesis will also address the issue of the mix of those youth attracted to the military.

F.   DEFINITIONS AND ABBREVIATIONS

To assist the reader of this report the following abbreviations and definitions will be used throughout:

- ASVAB - Armed Services Vocational Aptitude Battery. Used by the military services to select and classify enlisted personnel.

- AFQT - Armed forces Qualification Test. Derived from subtests of the ASVAB, it is a scale divided into five categories for reporting quality of enlisted accessions.

- NPS - Non prior service. This refers to those individuals who have never been members of the armed services.

G.   ORGANIZATION OF THIS STUDY

Chapter II provides a review of the literature pertinent to the research questions of the thesis. Chapter III describes the data and methodology used in the study. Chapter IV

contains the findings of the study, and Chapter V presents conclusions and recommendations

drawn from the study.

II. LITERATURE REVIEW

A. OVERVIEW

This study will attempt to determine the relationship between local economic conditions and the supply characteristics of the recruiting market. Other studies that have attempted research similar to this one include studies by McNown, Udis and Ash 1980, Dale and Gilroy (1983), and Brown (1985). All examined data at the state level and used enlistments as a percent of population as the dependent variable. McNown, et al. used a data set that mixed conscription and AVF periods. Dale and Gilroy used time series data only, while Brown, (1985) used pooled/ cross sectional and time series data.

One of the main differences between the current study and the prior literature is that this study will use data at the county level. Economic and county level data were obtained from the REIS and the City Counties, 1994 data bases. Bureau of the Census data are not used because they are taken from a random sampling of houses across the country. Some of the data was based on the Current Population Survey, but most data items were derived from the Bureau of Labor Statistics ES-202 "Place of Work" and "Place of Residence Surveys." A second innovation of this study is that it is the first time that the applicant data file has been used to look at what tempts an individual to apply to the military. As was mentioned earlier, previous studies have examined number of enlistments and what draws these individuals to careers in the military. Finally, this thesis looks at the impact economic variables have on the quality issue. Again, this has been done in the past but it has never been addressed at the county level.

One drawback to this study is the short time-frame over which the analysis was conducted. Data was only examined for 1993, 1994 and 1995. Clearly this thesis is a preliminary study that will provide a framework for future research.

B. PREVIOUS STUDIES

Several studies have examined the impact of regional economic conditions on recruiting markets. Some of the earlier studies looked across the time period when conscription was the means of acquiring individuals for military service with the All Volunteer Force era, which began in 1973. This provided earlier researchers with data availability problems and forced compromises in the construction of their models.(McNown et al., 1980). As time passed and the All Volunteer Force became an institution, studies evolved that focused only on the All Volunteer Force time period.

One of the earliest studies conducted was that of McNown, Udis and Ash. It was conducted in 1980 at a time in military history when high-ranking military officers, congressmen and academic sociologists were declaring the AVF a failure. President Carter, at this time, requested registration of all 19- and 20- year old males and females for possible military service (McNown et al., 1980). The quality of U.S. military forces was also being questioned.

The McNown, Udis and Ash study reports on unemployment and relative pay elasticities for total NPS accessions into the military calculated from semiannual, time series data from the first quarter of 1968 through the second quarter of 1976 (McNown et al, 1980). Conscription was still in effect over a large part of their sample. For this reason, total accession data was used to model total NPS accessions by race and service. The

education level of an accessed individual nor the individuals' mental category were examined in this study.

A dependent variable in the form of a rate was developed whereby the number of NPS male accessions is divided by the state's population of 18- to 19- year old males, and included a large number of inductees. This age group of 18- to 19- year old males was defined as being the primary source of NPS male accessions. Using a broader age group, according to McNown, Udis and Ash, changes in population differ little from those in the 18- to 19- year old age category. The independent variables consisted of civilian wages, military wages, unemployment, a time trend and a variable that predicted the probability of not being inducted into the armed forces. Linear, double-logarithmic and logistic functional forms were estimated.

Findings of the study indicate significant pay elasticities with unemployment being found to be statistically insignificant for enlistment rates or accession rates. Even at the 35 percent significance level, unemployment was not significant, with the estimated coefficient having the wrong estimated sign in 7 of 20 cases (McNown et al., 1980).

The principal focus of the study conducted by Dale and Gilroy, (1983) was to quantify the relationship between enlistments of NPS high school graduates and the unemployment rate. The focus of this study was to specify a more robust macroeconomic enlistment model since this relationship and its affect on military accessions is of particular interest to analysts and policy makers. This has been especially true since the inception of

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the AVF and particularly important in a depressed labor market where military service offers an attractive alternative to civilian unemployment (Dale and Gilroy, 1983). Dale and Gilroy specifically focused on the U.S. Army enlistments.

In this study, the dependent variable was defined as the total number of contracts signed-accessions plus delayed entry program entrants in a given month was used as the numerator and the relevant data of the state's civilian population of 16- to 19- year old males as the denominator. Data covering the time period October 1975 to March 1982 was obtained for the number of enlistments and contracts of NPS high school male graduates in the military services. A linear functional form was developed with unemployment (lagged two and four months) being a key independent variable. Other independent variables were basic military compensation which had a four month lead. A lead was incorporated to capture an assumption on the part of new enlistees to consider anticipated pay raises in their enlistment decision.

When comparing their work to previous studies, Dale and Gilroy found both a sizable effect on military enlistments in pay and unemployment. Other studies have only used accessions in the numerator as opposed to total contracts signed (accessions plus those in the delayed entry program). Seasonal dummy variables were incorporated because enlistment rates are highest and inflation-adjusted wage rates are lowest at the same time of year. Dale and Gilroy also found that a one-time transient shock to the system caused by a pay freeze would have a lasting effect on enlistment levels.

The authors did find that a rise in the unemployment rate has led to a substantial increase in Army enlistments of male NPS high school graduates. They also found that a

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freeze in military pay relative to civilian pay would cause enlistments to fall substantially. Non-economic factors also played a significant role in an individual's decision to enlist. Finally, educational benefits were very important to the high school graduate enlistees.

In Brown (1985) a study was conducted to determine the quantity and quality of volunteers who could be attracted at politically realistic wages. The policy issue question he was addressing was the availability of enlistees with desired characteristics such as a high school diploma and scoring in mental categories I-IIIA on the AFQT. Recruiting targets (or demand), according to Brown, will determine the number of enlistees who will be accessed for military service, while the number of high quality enlistments is supply determined.

Panel data over the time period of the All Volunteer Force was used in Brown's study. By doing this, one did not have to worry about holding constant the effects of the draft and the Viet Nam War, and variation was provided in unemployment rates and civilian earnings. State-specific dummy variables were introduced to take into account differences in tastes and abilities. Like the Dale and Gilroy study, this study was also conducted for the U.S. Army.

The dependent variables in this study are ratios of the number of contracts signed by male NPS Army enlistees to the enlistment age population (Brown, 1985). Those recruits that were analyzed fell into Categories I-IIIA of the AFQT; Categories I-IIIA high school graduates; all high school graduates; and all enlistees. The independent variables consisted of basic military compensation, educational benefits (despite the fact that their value is not realized until sometime in the future), military pay relative to civilian pay, total earnings and unemployment rates, which were derived from the Current Population Survey.

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Civilian wages had a negative effect on enlistments. That meant as civilian wages relative to military wages rose, fewer people were likely to enlist. Education compared to basic military compensation (BMC) is large. Again, this was most significant when the unemployment rate was the highest. It was also determined in this study that education benefits do attract a higher quality youth to military service.

The most significant difference between this and former studies is the fact that the unemployment rate has very large effects on enlistments. In fact, throughout all the equations that were run, unemployment is significant to some extent. The effects of unemployment were most significant for those recruits in the top 50 percent of the military's entrance exam (AFQT). This suggests that as unemployment falls, the Army will have a more difficult time attracting high quality recruits.

In summary, previous studies have addressed the number of enlistees demanded by the military. In two of the studies, unemployment was found to be either not statistically significant or only slightly significant. By using panel data, Brown(1985) found unemployment to be highly significant. Data studied was aggregated at the state level. Recruit quality was a concern in all the studies.

C. ARMED FORCES QUALIFICATION TEST

The military first started testing potential soldiers during World War I in order to give military commanders some measure of ability of their men, and to give personnel managers some objective means of assigning recruits.[3] Screening continued through World

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[3]Eitelberg, Mark J., Manpower for Military Organizations, Human Resources Research Organization, April, 1988 pg.

War II, with increased standards for becoming a soldier being implemented only months prior to the bombing of Pearl Harbor. The Army General Classification Test (AGCT), a test to measure "general learning ability" was developed during World War II.[4] At the end of World War II, the individual services developed and administered service-specific tests. This ended in 1950 with the development of the Armed Forces Qualification Test (AFQT). This test differed from the AGCT in that the AFQT was administered specifically as a screening device for potential recruits' aptitude. The purpose of the test was intended to identify those recruits who "could effectively acquire military skill" and it provided an index of the "potential usefulness for military service of the individual."

Several other aptitude screening tests were administered by the military services during the period of 1950-1974. The DoD, in 1974, required that all branches of the Armed Services administer a single test battery for both screening enlistees and for assigning them to military occupations. The Armed Services Vocational Aptitude Battery (ASVAB) was chosen for this purpose.[5] Despite periodical modifications, the ASVAB remains the military's single test battery for screening and job assignment. It is from the ASVAB that a composite score is compiled. It is this score that is used to determine into which AFQT category a potential recruit fall. Coupling the AFQT category of an individual with who has graduated from high school helps to ensure the right people are accessed into the military.

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[4] Ibid.

[5] Eitelberg, Mark J., <u>Manpower for Military Occupations</u>, Human Resources Research, April, 1988.

D. QUALITY HISTORY

"The American military has witnessed a number of changes in the ways of waging war and preserving peace over the past two centuries. Quality has been an issue with the military dating back to the days of the Civil War. While the majority of military men still performed combat duties, specialized soldiers were needed to fill jobs such as hospital steward, artificer, armorer, saddler, cooper, and the like."[6] The World Wars were no exception. In fact, World War One soldiers were the first of their kind to go through a selection process. These soldiers experienced the military's first large scale mental testing. Even though the results were less than staggering, with most of the soldiers testing illiterate or having limited command of the English Language, it did allow personnel officials the ability to discern and assign high quality recruits to the more challenging jobs the military had to offer.[7]

The General Accounting Office (GAO) defines quality as "one who performs in a military environment (training and on-the-job training) and behaves at an acceptable level, thereby contributing to unit effectiveness and mission accomplishment." Congress defines a high quality individual as a non prior service (NPS) male who has a high school diploma and scores in categories I-IIIA in the Armed Forces Qualification Test.[8] This is how the military is required to report end strength, and is the acceptable definition of quality.

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[6]Ibid.

[7]Ibid.

[8]General Accounting Office Report on Military Recruiting, 1994.

Legislative requirements state that at least 65 percent of NPS males accepted for military service must be high school graduates, and no more than 20 percent of annual accessions can be individuals who score in category IV of the AFQT. These individuals who score in category IV must be high school graduates. Those who score in Category V are not eligible for enlistment.[9] Congress places no standards on the numbers of NPS males that must test in AFQT categories I-IIIA. The benchmark set by the Department of Defense (DoD) is that at least 90 percent of recruits must possess a high school diploma, 60 percent must fall within mental categories I-IIIA on the AFQT, and no one can be accepted whose test score falls in category IV of the AFQT. The U.S. Navy sets its recruiting standards higher than both Congress and the DoD. The U.S. Navy states that at least 95 percent of its recruits must possess a high school diploma, 62 percent must score in categories I-IIIA on the AFQT, and no one that scores in mental category IV is qualified for enlistment.[10]

There were times in the military's history when accession goals were not met, and the thought of bringing back the draft was considered. However, all services have consistently met their accession requirements since the beginning of the 1991 draw down period. All services have exceeded the DoD's benchmark of recruiting greater than 90 percent of its recruits with high school diplomas and 60 percent scoring in AFQT categories I-IIIA. Fiscal 1994 was the third best year in military recruiting history with the Armed Service hitting other recruiting highs in 1991-1992. Fiscal 1992, after the invasion of Iraq

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[9] Ibid.

[10] Eitelberg, Mark J., Manpower for Military Occupations, Human Resources Organization, April 1988, pg.

(Desert Storm), was the military's top year in recruiting. In 1994, 96 percent of all recruits had a high school diploma with the percentage of high quality recruits being 68 percent. In particular, the U.S. Navy had 66 percent of all recruits in the high quality category, that is having a high school diploma and scoring in AFQT categories I-IIIA.[11] "Since 1991, the Armed Forces have successfully recruited the right quantity and quality of new recruits to meet personnel requirements,"[12] according to Fred Pang, Assistant Secretary of Defense for Force Management Policy.

E.   COST OF RECRUITING HIGH QUALITY INDIVIDUALS

This requirement for high quality recruits does not come without a price to society. Society and the local economies that are providing the military with high quality recruits pay a price also. That price comes at the cost of leaving those that do not meet the military's tough mental and physical standards and those who choose not to go to college, to fill the jobs in society and the local economy. This increases the cost of doing business, i.e. training costs and interview costs, for those businesses who hire these less than high quality individuals. By denying these individuals enlistment, it could be perceived by society that the military is not an equal opportunity employer. Parent's, teachers, and other positive role models, may view military service policies as unfair, and could discourage their charges from pursuing military careers.

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[11]News Release, Office of Assistant Secretary of Defense, Ref. No. 621-96.

[12]Navy Times Article, Military Recruiting-An All-Time High, August 1996.

F. ECONOMIC CONDITIONS

The 1990-1991 economic recession impacted the U.S. in some important ways that were different from other recessions. Although the recession was not long or deep, the recovery has been unusually weak or gradual, especially in terms of employment, it displayed an industry pattern noticeably different from earlier recessions.[13] Employment in manufacturing did not shrink as much as it has in the past, while retailing, finance, insurance and real estate were harder hit than usual.

New England's economy turned down sooner and suffered greater overall job loss than in past recessions. This region of the country lost 10.5 percent of non farm jobs compared to the nations' 1.7 percent job loss. The Mid Atlantic region was the next hardest hit, with the region losing over five percent of peak employment by the fall of 1992.[14] The Pacific region's unemployment has increased, but not as dramatically as the Northeast. One can then summarize this recession as a bi-coastal recession.

The 'type' of unemployment is also different from that experienced in past recessions. The job loss has been more 'permanent' job loss with "permanent job losses being defined as job losses other than layoffs; that is, the unemployed in this category have been told not to expect a callback to their last job."[15] Those individuals who found

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[13]Bradbury, Katharine L., "Shifting Patterns of Regional Employment and Unemployment: A Note," New England Economic Review, Sept/Oct 1993, pgs 3-12.

[14]Ibid, pgs 3-12.

[15]Bradbury, Katharine L., "Shifting Patterns of Regional Employment and Unemployment: A Note," New England Economic Review, Sept/Oct 1993, pgs 3-12.

themselves in this category were unemployed longer, 15 or more weeks longer in 1992, than those who were just laid off.

Again, New England was the hardest hit economic region in the United States. This, in part, is a result of the region's long-term loss of manufacturing jobs. The Pacific region's job loss follows that of New England. However, manufacturing in the Pacific region was growing before the recession, and the recession came later there, so job losses can be expected to take the form of layoffs rather than permanent job losses. Both regions rely heavily on defense contracts, and with the government cutting back on defense spending, this could be one explanation for more permanent job losses.

Another related phenomenon to this recession is the increase in white collar job losses. The unemployment for this group has increased in all regions, with the fraction of unemployed wearing white collars rising from 36 percent to 39 percent in 1992.[16] Typically during a recession, blue collar workers make up a larder percentage of those unemployed. Normally, it was easier for a white collar worker to find employment after being terminated than it was for a blue collar worker. This was not the case after the 1990-1991 recession. As a result, particularly in New England, white collar professionals entered the ranks of the self-employed.

In summary, this study differs form the works of previous authors in that the dependent variable is the total number of applicants, rather than enlistments to the military. Data for the independent variables were gathered at the county level and models

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[16]Ibid, pgs 3-12.

were built to measure the impact of these variables on the number of applicants over counties in a given year (cross section models). Panel models are estimated that measured the impact across counties and across time, and finally the quality issue is addressed using cross sectional models and panel models.

III. DATA METHODOLOGY

A. OVERVIEW

Again, one must realize that this is a preliminary study from which future, or follow on, research can be based. It is important to note that this study does not attempt to break individuals out into separate models based on sex, race, age, and other demographic characteristics. The demographic variables that are included in the study are calculated as a percentage of the county population and are not necessarily characteristics of the individual applicants. This study will attempt to establish a relationship between the number of applicants to the military and the impact of economic conditions on this measure of supply, and will do so by examining county-level data. Not only will this study examine this relationship, it will take it one step further and examine the quality issue. Since there is legislation dictating the quality of youth who can serve, it is important to know what the supply of quality applicants is at the local geographic level. Quality standards for accessions must be maintained, and to date the military has been meeting, and exceeding, the annual requirements for high quality youth.

Data for this study were obtained from three different sources and they were collected in three stages. In stage one, data was obtained from the Defense Manpower Data Center on all individual applicants to the Armed Forces for 1993, 1994, and 1995. This data set also included such variables as AFQT percentile and categorical scores and demographic background characteristics on individual a. It is from this data set that the individual

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applicants were matched to the specific county/state from which they applied for enlistment into the military (based on "home of record"). This allowed us to count the total number of applicants by county by year.

Economic data was obtained from the Regional Economic Information System (REIS), which provided information on total personal income, employment and earnings at the county level. Additional data was obtained from the Department of Commerce's USA Counties 1994 data base. It was from this data source that additional variables were obtained for each county, including poverty, education, Hispanic population, unemployment and crime rates. The REIS variables as well as the USA Counties 1994 variables were merged by county with the file containing the number of applicants for each county. A detailed description of the data sets that were used follows.

1.   Applicant Data Set

The applicant data that was provided by the Defense Manpower Data Center was a condensed version of the MEPCOM Edit File. It contained demographic and test score data on applicants to the U. S. Armed Forces for each of three years--1993, 1994, 1995. The military applicant data can be viewed as one measure of enlistment supply from which military recruiters can apply pre-determined criteria based on policy to select those eligible for enlistment. It is a data set that includes individuals who have not yet been screened according to the military's selection standards, but who are interested enough to apply for enlistment. Some will be screened out due to failure to meet medical, moral or physical

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standards. Others will enlist, some will self-select out of the enlistment process, and still others will enter the military's Delayed Entry Program and either enlist or self-select out at this stage.

2. Regional Economic Information System

The Regional Economic Information System provides information on personal income and per capita personal income for 1969-1994 for metropolitan areas and counties. The data file was prepared by the Regional Economic Measurement Dividion of the Bureau of Economic Analysis (BEA). Estimates are also provided for the entire United States for eight BEA regions and for the 50 states. Annual population estimates from the Census Bureau are used for the per capita calculations. Estimates are also provided for personal income by major source and labor and proprietor's earnings by Standard Industrial Classification (SIC) two-digit industry, employment as measured by the sum of the number of full-time and part-time jobs, transfer payments by major program and farm income and expenses.

Wage and salary employment, earnings and some of the variables that go into the compilation of personal income are derived from the Bureau of Labor Statistic's ES-202 program. This is a "place of work" survey and therefore, individuals may not work and live in the same county as the industry reporting the statistic. Other variables that are included in the personal income calculation are derived from "place of residence" surveys. Because some of the variables that go into the calculation of personal income are calculated on the basis of where a person lives, those variables that are calculated on a place of work basis are

adjusted to allow personal income figures to be based on place of residence. All data are collected at the national level and disaggregated at the state/county level.

Employment by industry, both full and part-time, is measured as the average annual number of jobs, with each job a person holds being counted at full weight. Again, these estimates are derived from the Bureau of Labor Statistics ES-202 survey, and done on a place of work basis. The estimates are organized by wage and salary employment and self-employment, with self-employment being estimated on individual and partnership income tax returns.

3. USA Counties 1994

This data base consisted of 2,844 data items and includes all of the data published for counties in the last three editions of the State and Metropolitan Area Data Book (1991, 1986, 1982) and the County and City Data Book (1994, 1988, 1983), as well as data items not previously published. States and their respective counties are identified by a five digit Federal Information Processing (FIPS) code that is issued by the National Institution of Standards and Technology. The objective of this code is to improve data resource transfer within the Federal Government and to avoid unnecessary duplication and incompatibilities in the collection, processing and dissemination of data. This code is used to merge various data files. Data is provided on age, agriculture, ancestry, crime, business patterns, poverty, education and earnings, to name a few. Geographic data is provided for the United States, the 50 states and the District of Columbia, and covers 3,141 counties or county equivalents.

States are the primary governmental divisions of the U.S., and counties are the primary political divisions of most states. Some states refer to their counties as parishes

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(LA) or boroughs (AK). Four states, Maryland, Missouri, Nevada and Virginia have one or more incorporated places that are legally independent of any county and thus constitute primary divisions of their states. Montana's portion of Yellowstone National Park is treated as a county equivalent, as well as the entire area of the District of Columbia. The data base includes information on the 3,141 counties in existence as of January 1, 1990.

As stated before, county-level characteristics obtained from these various sources were used in this study. Crime, education, labor force participation and Hispanic population were all thought to be important influences in what drives individuals from a local area to seek employment in the military. The civilian unemployment rate was a variable that has been found to be significant in explaining local area enlistment supply (Brown, 1985). The unemployment rate was also considered to be a key variable for this study.

Crime figures were obtained from the Uniform Crime Reporting Program. This program provides periodic assessments of crime in the nation as measured by offenses that came to the attention of the law enforcement community. Although this database lists several categories of crime, this thesis uses serious crimes known to police per 100,000 population, with population figures for this variable being derived from the FBI database.

Civilian labor force participation data are the product of a Federal-State Cooperative program in which state employment security agencies prepare labor force and unemployment estimates by using procedures established by the Bureau of Labor Statistics.

County estimates of unemployment are derived through statistics from state unemployment insurance operations, with adjustments based on Current Population Survey data, decennial census and other sources.

B.   MODEL SPECIFICATION

Applicant data was sorted by state and county to obtain a county level data set. As was stated earlier, the FIPs codes are created by merging the state code with the county code provided in the MEPCOM Edit File. Economic and other county-level variables (from REIS and USA County data) were applied and the number of applicants was regressed against the variables from these data files. Separate regression models were developed for each of the three years of data. This was done because not all of the demographic variables were available for all three years, for example, black, Hispanic, Asian, education, were only available for 1990 and the crime rate for 1991. When one examines these regressions individually one should be able to see how the economic and demographic variables impact the number of applicants separately in each of the three years.

Stage II of the analysis involved pooling the three years of data and discarding the demographic variables that were not available for all three years. By merging the three years of data, one could determine whether mainly economic variables influenced the number of applicants the military received over that period of time, since many of the demographic variables were dropped.

Finally, a fixed effects model was run. This is a technique that essentially incorporates county-level dummy variables into the model. This enables one to examine the

economic effects in a given county for that period of time while holding constant any unobserved effects that are constant across counties.

This study is a preliminary analysis of the supply of applicants to the military. Ordinary Least Squares (OLS) was chosen as the method for estimation of this model. OLS transforms the theoretical equation of $Y_i = \beta_0 + \beta_i X_i + \epsilon_i$ into an estimated equation to approximate the true population. The goal of OLS is to obtain numerical values of the coefficients (β_0, β_i) of an otherwise completely theoretical regression equation.[17] Ordinary Least Squares calculates the estimated β's so as to minimize the sum of the squared residuals, or $\sum(Y_i - \text{mean of } Y)^2$. The estimated regression line passes through the means of Y and X. This states that the mean of Y and X can be substituted into the estimated equation and it will maintain its integrity. OLS chooses the estimated β's to minimize the sum of the residuals.[18]

C. THEORETICAL MODEL

The reasons for applying to the military vary by individual. Local economic conditions, education level of the individual, family background and personal characteristics such as race, age and marital status, career intentions, and earnings potential are all factors that influence an individual's decision to apply to the military. There are also non-monetary factors that influence this decision. Patriotism, being from a military family, and desire for adventure are other reasons an individual may seek to join the military. Note that this

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[17]Studenmund, A. H., Using Econometrics, A Practical Guide, 1992, pg 32.

[18]Ibid, pg 42.

research will not use the characteristics of individuals but, instead, will aggregate the applicants from each county and use the county's characteristics, mostly economic in nature, to predict the supply of applications.

1. Dependent Variable

Since the premise of this study is to measure supply, and how economic conditions affect supply, the total number of applicants to the military was chosen as one dependent variable. This variable is measured as the total number of applicants to the military for each county. When one is examining the regression models for the individual years, this variable is the total number of applicants to the military in that specific year. In the pooled models, the dependent variable represents all applicants to the military by county over the three year time period.

To compare this study to previous studies, e.g., Brown (1985), it was decided to also use the applicant rate as a dependent variable, where the rate is measured as the number of applicants divided by the population. Note that the total population measure includes individuals who may or may not be employed and individuals who are either below or above the prime recruiting ages (17-21). However, we can assume that the prime recruiting market is some constant proportion of total population. As long as the proportion is constant across counties, the application rate will understate the true rate, but the measurement error will be the same for all counties.

2. Explanatory Variables

The explanatory variables that were used in the individual models are listed below. Table I gives a list of these variables with expected sign and a brief definition of the

variable. The models are estimated separately for each year, and then pooled to create a fixed effects model. Table I gives variable definitions with the expected sign of each variable.

Table I. Variable Definitions and Expected Sign

Variable	Expected Sign	Definition
Average Earnings	negative	Private earnings/private employment
Log per capita personal income	negative/positive	Log of per capita personal income
Labor Force Rate	positive	Labor Force Participation Rate
Unemployment Rate	positive	Unemployed/Labor Force
Hispanic Population Rate	positive	Hispanic Population/ Population
White Population Rate	positive	White Population/ Population
Black Population Rate	positive	Black Population/ Population
Asian Population Rate	positive	Asian Population/ Population
Education in 1980	negative	Median Education level in 1980 for those over 25 years
Crime, 1991	positive	Crime per 100,000 population in 1991
Number of Applicants	Dependent Variable	Total number of applicants to the military by county
Applicant Rate	Dependent Variable	Total number of applicants to the military divided by population

Labor Force Participation Rate--This variable is defined as the labor force of a given year divided by the population for that year. It was defined as a rate to maintain consistency with the way the unemployment variable was defined. It was more narrowly defined than

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population, which is based on the Bureau of the Census decennial survey estimates because the labor force is comprised only of those individuals 16 years of age and over that are classified as employed or unemployed. The expected sign of this variable is positive, which means that for a one percent unit increase in the labor rate participation variable, the number of applicants should increase by the estimated β of X. This variable was introduced to account for population. It may also be an indication of the percentage of individuals who commit to enlistment in the military. The more positive this variable is, the better the economy should be, with the opposite also being true. It may also be an indication that the right jobs are being filled with the people who have the right skills to perform the job.

Unemployment Rate--This variable is defined as those individuals who are unemployed but are still actively seeking employment divided by the labor force. This variable is very important to this study because previous studies have found unemployment to be statistically significant in explaining military enlistments (Brown 1985). Unemployment is a measure of the health of the local economy. It is expected that as this rises, the availability of jobs in the civilian sector falls and

Average Earnings--This variable is defined as private weekly earnings divided by private employment. The private sector earnings and employment were chosen mainly because this is the military's primary competitor for labor supply. Self-employment (earnings) could be an issue, but because of the youth of the group interested in military service and their lack of marketable skills, this was not considered to be an issue relevant to this study. It is

important that some measure of earnings be incorporated into the regression model though, holding constant the unemployment rate because as the civilian earnings rise, interest in the military should fall.

Personal Income--Income is a variable that follows a lognormal distribution. It is also a variable that can take on a wide range of values, from extremely small to extremely large. For this reason, the log of per capita personal income was chosen as the form for this variable, and was derived by taking total personal income and dividing it by the population as defined in the REIS data base. This variable was expected to have a negative impact on the number of applicants to the military. By definition, it is the income received by all the residents in a given area, and like education, could be viewed as a measure of the affluence of a given county.

Hispanic, Black, White and Asian Population Percentages--These rates are established as the number in each group divided by total county population. The expected sign for all these variables is expected to be positive signifying that for an increase in the population share for each group, the larger the number of military applicants. As the demographics of the country shift from a predominantly white male labor force, to one that is comprised of more minorities, it is important to know how economic conditions affect these racial groups, and their intent to seek military employment.

Crime--For the purposes of this study, crime is defined as those crimes of a serious nature brought to the attention of local law enforcement agencies per 100,000 population in 1991. Population for this variable is defined in terms of the FBI database. One would expect that as the crime level increases in a given county, the number of those seeking military

application should also increase. Employment in the military would provide the individual a way out of the area, and could provide them with the skills that could enable them to avoid returning to that area. Crime should also reflect the poverty level in each county.

Education-This measures the median years of education in the county. Since education is correlated with income, it is partially a measure of the affluence of the county. Consequently, the sign of this variable is expected to be negative.

3. Quantity Models, (Applicant Rate)

a. Cross Sectional Models

This is stage I of the study, which regresses the number of applicants on economic variables in each of three years. The results of these models should give the reader some idea of the impact of the economic variables have on applications in a given year.

b. Fixed Effects Model

In stage II, county-level dummy variables are introduced into the model. In essence this stage tries to duplicate Brown's (1985) fixed effects model at the state level. By running a fixed effects model essentially all counties except the one being examined is held constant. This allows the researcher to examine the impact that the explanatory variables have on the number of applicants to the military after controlling for any unobserved fixed effects. The next chapter explains the empirical results.

IV. DATA ANALYSIS

A.   OVERVIEW

This chapter discusses the results of the simple statistics and the regression models. By evaluating the simple statistics, one should gain further insight into the data. Explanatory variables are lagged because economic theory states that it takes time for the economy to recover after any downturn in the business cycle. Therefore, the interpretation of these coefficients measures the change in this year's dependent variable attributed to a one unit change in last year's explanatory variable (Studenmund, 1992, pg. 68). Since 1991 marked the longest and hardest recession this country has felt to date, it is only reasonable that the models were lagged.

The regression results are discussed in three stages. Initially, the cross sectional models are analyzed and discussed using the application rate as the dependent variable. Next, the pooled data is analyzed (the combined data for number of applicants for 1993, 1994, 1995). Finally, a fixed effects model is estimated using the pooled data.

B.   PRELIMINARY ANALYSIS

Table II depicts the means (or proportions) and standard deviations of the variables used in the regression models. If one were to examine the tables, one would note that the mean number of applicants for each of the three years increased, with the biggest increase in number of those interested in military service occurring between 1993 and 1994. This was almost a 100 percent increase in the number of applicants.

One would expect an increase in those interested in military service when

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unemployment is highest, all else equal. This is not the case, however, for the three years in question. The unemployment rate for 1993 was the highest of the three years. This value was lagged, and was still high because the country was coming out of the recession of 1991. In each of the subsequent years, the unemployment rate decreased from 6.95 percent to 6.29 percent. This would lead one to believe that there are other factors that played into an individual's decision to join the military.

Table II. Means and Standard Deviations of Variables by Years

Variable	1993	1994	1995
Number of Applicants by County	58.8753 (115.032)	115.97 (316.9806)	118.2564 (329.6485)
Average Earnings/hour	18.4332 (4.554)	19.4287 (4.8431)	20.0529 (4.8695)
Per Capita Personal Income	138157.33 (821109.00)	143655.42 (853759.59)	149199.74 (887907.37)
County Population (1,000's)	85.9138 (279.1150)	86.8547 (281.1358)	87.8241 (282.7095)
Private Employment Rate	0.7249 (0.2247)	0.7282 (0.2235)	0.7342 (0.2212)
Unemployment Rate	0.0755 (0.0322)	0.0700 (0.0307)	0.0623 (0.0286)
Hispanic Rate (1990)	0.0447 (0.1103)	0.0436 (0.1106)	0.0447 (0.1104)
Black Rate (1990)	0.0841 (0.1408)	0.0841 (0.1408)	0.0841 (0.1408)
Asian Rate (1990)	0.0070 (0.0268)	0.0070 (0.0268)	0.0070 (0.0268)
White Rate (1990)	0.6523 (0.1799)	0.6523 (0.1799)	0.6523 (0.1799)
Crime Rate per 100,000 (1991)	3281.34 (2238.40)	3281.34 (2238.40)	3281.34 (2238.40)
Education Level, 1980	12.0221 (0.8449)	12.0221 (0.8449)	12.0221 (0.8449)
Applicant Rate	1.1046 (1.1191)	1.5196 (0.7814)	1.5239 (0.7352)

Note: Standard Deviations are in parentheses

C.   EMPIRICAL ANALYSIS

Initially, an unweighted model was run for each of the three years that data was available. However, to alleviate some of the problems associated with heteroskedasticity, weighted models were also run for each year. Both the unweighted and weighted estimates

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for 1993 are displayed in Table III. Table IV displays the parameter estimates for 1994, while Table V displays them for 1995. Each model regresses the application rate as the dependent variable.

These parameter estimates were obtained using the Ordinary Least Squares technique. The estimated coefficients show the change in the dependent variable for a one-unit change in one of the independent variables, while holding the remaining variables constant. For example, a coefficient of .556 means that holding all other variables constant, a one-unit increase in the independent variable leads to .556 more applicants to the military.

D. MODELS, APPLICANT RATE 1993, 1994, 1995

1. Cross Section Models

Cross sectional models are models that examine the variation in the applicant rate in a given year. For this study, a total of 12 models were run. Two unweighted and two weighted models were run for each of the respective years--1993, 1994, and 1995. The difference between the models was in the choice of the explanatory variables. Models 1 and 3 did not incorporate any of the demographic type variables, whereas Models 2 and 4 included demographics. It is important to note that only one year of demographic data is used and applied across all three years of the study.

a. Results for 1993

Table III reveals the results of the cross sectional model for 1993. As one examines the results, it should be noted that many of the signs are contrary to what was predicted in Table I. Average earnings was predicted to have a negative impact on the number of applicants to the military. The estimated sign was negative, indicating that for

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a one dollar increase in lagged average earnings in 1992, the rate of applicants to the military in 1993 decreased-as was expected.

The population and labor force participation rate variables were thought to be interchangeable. However, the correlation between the two was high. Again, the entire population is not employed concurrently. Population was also very highly correlated with the rate of applicants to the military. The population variable signifies that for a one unit increase in population, .10 more individuals apply to the military in a county. It was also a highly significant variable, but with the dependent variable being a subset of population, one could not rely on its accuracy as a predictor.

By dividing labor force participation by population, the model adjusted somewhat for the inclusion of everyone in the population figure. It is also expected to be positive in its effects on the number of applications the military receives. Most of the individuals who join the military come from the group known as the prime recruiting market. This group is comprised of those individuals age 17-21 who have just completed high school. For most this is the first time these individuals have searched for employment, may have entered the labor market and were not happy with that decision, or those who entered college and for whatever reasons terminated their enrollment, and the impact this has on those who apply is very small and not significant and only significant at the ten percent level of significance.

The unemployment rate was significant at some level for all four models run in 1993. However, the sign of the estimate was negative, contrary to expectations. This says that for a one percent increase in the unemployment rate, the rate of applications to the

military should decrease anywhere from one to three individuals in each county. This is contrary to economic theory in that if the unemployment rate increases, the number of applicants to the military should increase. This unexpected sign could be due in part to the interaction between this variable, the labor force participation rate variable, and the private employment rate.

The Hispanic, black and Asian rates are all expected to be positive, and the coefficients are positive in Table III. However, none of the coefficients are significant.

In a pure sense, the more education an individual has, or those who influence him/her have, the less likely that individual should be to apply to the military. However, given certain economic conditions, high unemployment, low private sector employment, an individual will choose the military over being unemployed and without a paycheck. Since this is an OLS equation, one can not ascertain the impact one independent variable has on another, the expected sign for the education variable should be negative. The education variable carries a positive sign, and in most instances is only slightly statistically significant. The education variable must be interacting with the other explanatory variables to cause this reversal in signs. It is also in keeping with economic theory that as the economy becomes worse off, individuals who are better educated will seek the military as a possible employer.

Crime is statistically significant, and carries the predicted sign. The variable can be interpreted for each additional crime committed at the county level, the rate of applicants to the military increases. The size of the effect may be due to perceptions of a crime ridden area. Individuals by county may view the area as the kind of place where they

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do not want to work or live. Unless an individual is directly affected by crime, then this factor may not impact heavily the decision to apply to the military.

The coefficient of determination, R^2, ranges in 1993 from .03 to .05. This figure is the goodness of fit of the model, or how much variation is explained by the independent variables. For this year, the R2's that centered around five percent explanatory power were considered to be the best models. The .02 percent difference in the R^2's could be attributed to the interaction that population had with the dependent variable.

Table III. Parameter Estimates, 1993 (t-statistics in parentheses)

	OLS	OLS	Weighted L.S.	Weighted L. S.
Variable	Model 1	Model 2	Model 3	Model 4
Average Earnings, 1992	-0.0119 (-2.000)**	-0.0192 (-3.381)***	-0.1234 (-10.638)***	-0.1254 (-10.968)***
Population, 1992	0.0001 (-0.073)	-0.0004 (-4.620)***	-0.0103 (-0.983)	-0.0006 (-1.163)
Unemployment Rate, 1992	-1.9091 (-2.529)**	-1.6946 (-2.251)**	-0.7035 (-0.474)	-0.8412 (-0.569)
Hispanic Rate	0.0008 (0.766)		0.0035 (0.58)	
Black Rate	0.0017 (0.865)		0.0018 (1.625)	
Asian Rate	0.0012 (0.392)		0.0020 (1.306)	
White Rate	-0.0017 (-0.813)		-0.0024 (-1.627)	
Education Level, 1980	-0.1086 (-3.553)***	-0.0004 (-4.620)***	0.0169 (0.286)	-0.0025 (-0.042)
Crime, 1991	0.00001 (1.558)	0.00001 (1.594)	0.00008 (3.321)***	0.00009 (3.407)***
R-squared	.0406	.0301	.0542	.0514
Dependent Variable	Ratio	Ratio	Ratio	Ratio

Source: Data provided by the Defense Manpower Data Center, REIS, and USA Counties 1994

***Indicates significance at the .01 level
** Indicates significance at the .05 level

b. Results for 1994

Table IV reveals the unweighted as well as the weighted results for the cross sectional models run for 1994. One very interesting difference from the 1993 models is that

more of the variables in the models carry the predicted signs. Since all the data is lagged one year, 1994 (using 1993 economic data) could be viewed as a sign of recovery for the economy.

(1)   Unweighted 1994 models. Average earnings in the first unweighted model achieved the anticipated sign--that of being negative. This states that as the average earnings in the county increase by one percent, the number of applicants to the military decreases by .04. It is statistically significant, but small in size. Unweighted Model 2's average earnings variable also carries the correct sign and is also statistically significant. This is even after the demographic variables were excluded from the model. The impact this removal of the race variables has on the number of applicants to the military is slightly larger than the previous model and mean that economic conditions have a bigger impact on who joins the military than demographic attributes.

The unemployment rate is beginning to carry the predicted positive sign and is highly significant. Since it takes the economy some time after a recession to bounce back, the high unemployment rates of the early 1990's could be affecting a person's choice to apply to the military (unemployment high, no private sector jobs, join the military). Despite the fact that the average unemployment rate is decreasing, this decrease may not be indicative of every county. A county in the North may recuperate more quickly than one in the south, or vice versa. This could explain why that for every one percent increase in the unemployment rate, the number of applicants to the military is increasing by slightly over five. If one goes back to Table II, one would see the average number of applicants by county to have increased from 58 to 116. Again when the race variables are removed from the

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unweighted model, unemployment remains statistically significant with the number of applicants to the military increasing very slightly.

The race variables rate sign is opposite to what was predicted, positive, and is only statistically significant for Asians and blacks (although at a very low level of statistical significance). One would expect that as unemployment increases, more minorities would apply to the military. Examining the demographic trends into the 21st century, females and minorities are expected to comprise more of the labor market than white males. If this were the case, then one should see a positive relationship between the race variables and the number of applicants to the military when unemployment is low. The white rate variable is statistically significant, but opposite to the predicted sign of positive. Once again we would expect that as the unemployment rate increased, the number of whites applying to the military would increase. These variables may be carrying negative signs because of the interaction between population and the appearance of population in the denominator of the dependent variable.

The sign achieved for education level is negative as predicted. It is, however, not statistically significant for either of the unweighted models. This states that as unemployment increases, the education level of those applying to the military would also be lower. This would be predicted from economic theory as well. As the economy falls, and the number of available jobs decreases, employers will seek those individuals with a higher level of education. This does not mean that the military will accept those individuals (the

military will only accept those in the upper mental category), it just states that more individuals will seek employment with the military because of a lack of jobs in the private sector.

The crime variable is still significant, but only showing an impact on the number of applicants to the military of .0004 to .00028. Crime in a county directly and positively impacts the number of applicants to the military, with more applicants coming from counties that have a higher crime rate.

The R^2 in Models 1 and 2 are .0768 and .0684 respectively, and are low for cross sectional data. This indicates that variables that could explain an individual's decision to apply to the military were not included in either model. The year in question, 1994 used data from 1993, which was also the end of Operation Desert Storm. An increase in applicants to the military in this year could have been attributed to an increase in patriotism. It may be in that year people were driven to apply to the military more for intrinsic reasons than for economic reasons.

(2) Weighted 1994 Models. Because the models that are being run are cross sectional, and the variation in population across counties is great, one would expect an increased likelihood for heteroskedasticity to occur within the models. To more accurately estimate the impact of the independent variables, weighted least squares method of estimation was applied to Models 3 and 4. By doing so, the estimates of the β "hats" will approximate the β "hats" of the population.

Looking at the average earnings variable in the weighted Models 1 and 3 in Table IV, one can see that the sign is opposite to what was predicted. In both

models, the average earnings variable is statistically significant. The military targets those youth in what is considered the prime recruiting market (17-21 years of age). For this category of youth, the military is more than likely their first real job. Some may view it as a way of learning a trade, or earning money to apply towards a college education at the completion of their tour of duty. As average earnings increase in a county, those individuals may seek military employment because they lack the skills necessary to earn the civilian salaries available in their county. By joining the military, they can achieve skills that would enable them to earn more money.

Population in Model 3, Table IV (Model with race variables) has the correct sign, but is not statistically significant. This could be attributed to the fact that in the same Model, population is broken down into various demographic groups. In Model 4, the population variable is statistically significant, but is negative. As the population increases, the number of applicants to the military decreases. With a limited amount of jobs available in both the private and public sector, one would expect that as the population increases, less jobs would be available, and more would apply to the military. This variable is not a good variable as it stands. Population includes everyone in a demographic area. Therefore, it includes those individuals who are both too young and too old to apply to the military.

As in the unweighted models, the unemployment rate variable is correctly signed and highly statistically significant. There are some differences in the magnitude of the β's, but the differences are small. Again this variable states that as the unemployment rate increases, the number of people applying to the military also increases.

The only demographic variable that was statistically significant was the White population rate, and only at the 20 percent level of statistical significance. Like the unweighted models, the variables were contrary in sign to what was predicted. All demographic variables carried a negative sign. This could be because of the inclusion of population as an explanatory variable in the model.

Education level in Model 3 was opposite in sign to what was predicted. However, in Model 4, the sign carried by this variable was correctly signed, and in both models, the variable was not statistically significant. Crime, like the unweighted models was highly statistically significant, but only impacted the number of applicants to the military minimally. The mean crime rate (per 100,000) was 3,281. Individuals may view this as a major driving force for them to apply to the military, but it does not impact the actual numbers who apply by that much.

The explanatory power for Models 3 and 4 was .0598 and .0520, respectively. This is a decrease in explanatory power from the unweighted models, but that can be attributed to the fact that these models were weighted to alleviate the heteroskedasticity that was present in the unweighted models. The low R^2's, as in the unweighted model could be attributed to the lack of inclusion of variables that could explain and individual's decision to apply to the military for employment.

Table IV. Parameter Estimates, 1994 (t-statistics in parentheses)

	OLS	OLS	Weighted LS	Weighted LS
Variable	Model 1	Model 2	Model 3	Model 4
Average Earnings, 1993	-0.0005 (-0.134)	-0.0062* (-1.758)	0.0132*** (3.027)	0.0106*** (2.465)
Population, 1993	0.0027** (2.207)	-0.0003*** (-4.901)	0.046 (1.177)	-0.0007*** (-3.519)
Unemployment Rate, 1993	5.2865*** (10.402)	5.5392*** (10.927)	5.543*** (9.343)	5.6026*** (9.441)
Hispanic Rate	-0.0025 (-0.326)		-0.0004 (-0.178)	
Black Rate	-0.0016 (-1.309)		-0.0033 (-0.085)	
Asian Rate	-0.0044 (-2.134)		-0.0061 (-1.032)	
White Rate	-0.0039*** (-2.947)		-0.0073* (-1.739)	
Education Level, 1980	-0.0092 (-0.468)	-0.016 (-0.824)	0.0010 (0.046)	-0.0082 (-0.367)
Crime per 100,000, 1991	0.00004*** (5.360)	0.00028*** (5.673)	0.0004*** (3.260)	0.00004*** (3.584)
R-squared	0.0768	0.0684	0.0598	0.0520
Dependent Variable	RATIO	RATIO	RATIO	RATIO

Source: Data provided by the Defense Manpower Data Center, REIS, and USA Counties 1994

***Indicates significance at the .01 level
** Indicates significance at the .05 level
* Indicates significance at the .10 level

c. Results for 1995

Table V reveals the unweighted and weighted results of the cross sectional model for 1995. These results are quite similar to the results obtained from the 1994 models with a few exceptions.

Average earnings is correctly signed in the unweighted models (negative), but is statistically significant only in Model 2. The variable for unemployment is again correctly signed and statistically significant.

Crime is again statistically significant, but not to the extent that it was in the models run for 1993 and 1994. The variable was correct in sign, and impacted the dependent variable as predicted. Crime level in an area may not be something that specifically drives a person to apply for the military. It may be thought of more in the lines of 'that place has a high incidence of crime, therefore it is not a place to seek employment or not a good area in which to live.' Models 1 and 2 reveal higher R^2's than the weighted models 3 and 4. Again, because of the lack of inclusion of variables that could increase the model's explanatory power may explain the low R^2 in both the unweighted and weighted models.

Table V. Parameter Estimates, 1995 (t-statistics in parentheses)

	OLS	OLS	Weighted LS	Weighted LS
Variable	Model 1	Model 2	Model 3	Model 4
Average Earnings, 1994	-0.0015 (-0.431)	-0.0072** (-2.224)	0.0159*** (4.096)	0.0131*** (3.422)
Population, 1994	0.0027** (2.550)	-0.0003*** (-4.868)	0.0051 (1.615)	-0.0006*** (-3.318)
Unemployment Rate, 1994	6.184*** (12.223)	6.447*** (12.769)	5.746*** (9.783)	5.865*** (9.983)
Hispanic Rate	-0.0001 (-0.189)		-0.0002 (-0.097)	
Black Rate	-0.0015 (-1.465)		5.0111 (0.016)	
Asian Rate	-0.0048*** (-2.927)		-0.0080 (-1.630)	
White Rate	-0.0039*** (-3.370)		-0.0079** (-2.261)	
Education Level, 1980	-0.0018 (-0.098)	-0.0087 (-0.475)	0.0198 (0.978)	0.0113 (0.556)
Crime, 1991	0.0004*** (5.449	0.0004*** (5.919)	0.00001 (1.466)	0.00002* (1.852)
R-squared	0.0960	0.0841	0.0618	0.0519
Dependent Variable	RATIO	RATIO	RATIO	RATIO

Source: Data provided by the Defense Manpower Data Center, REIS, and USA Counties 1994

***Indicates significance at the .01 level
** Indicates significance at the .05 level
* Indicates significance at the .10 level

2. Fixed Effects Model

Dummy variables are introduced in an equation to account for variation that may be specific to individual counties. In addition to geographic fixed effects, annual dummy variables also are introduced, where each equals 1 for a given year, for each of the three years included in the data file. This is panel data and has pooled the cross sectional data as

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well as time series data into one data set. By pooling the data, one allows the regression

parameters of the coefficients to change over time, and across the counties. The fixed effects

model will enable one to obtain more precise estimates, make stronger inferences, and

possibly obtain better predictions because of the size of the data set.[19] The results of this

equation can be found in Table VI.

Table VI. Fixed Effects Model on Applicant Rate

Variable	Average Earnings	Unemployment Rate	Private Employment Rate
	-44.9889 (-17.70)	0.9036 (5.42)	-705.1257 (-7.23)
R^2	.803		
Sample Size (n)	8,296		

Source: Data provided by the Defense Manpower Data Center, REIS, and USA Counties 1994
Note: Significant at all levels of significance

When pooling the data, all variables remain significant. Average earnings is

correctly signed and is interpreted as meaning that as average earnings increase county-wide,

an individual is less likely to apply to the military. This result is consistent with the cross-

sectional models. The unemployment rate in a county was also statistically significant at all

levels of significance, and was consistent with the findings of the models previously run.

As the unemployment rate in a county increases, the rate of applicants to the military also

increases. Our society as a whole could be termed a 'migrant society' meaning that an

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[19]Gujarati, D. N., Basic Econometrics, 1995, pg 523.

individual is more likely to leave an area of high unemployment in search of an area that has a lower unemployment rate. By the unemployment rate being significant, one could assume that for the prime recruiting age market, those individuals are less willing to migrate to an area of lower employment. It may also explain why the unemployment rate in a county contributes significantly to the rate of applicants to the military.

Private employment is defined as that employment in the private sector. If private employment is high, and the jobs are plentiful in the marketplace, an individual is more likely to seek private sector employment, and less likely to apply to the military. This is correctly signed, and is consistent with the unemployment rate variable. The R^2 for the fixed effects model is .803. This describes the explanatory power of the model, and states that 80 percent of the model can be explained with the existing explanatory variables.

E.   PROBLEMS ENCOUNTERED

The major problem that was encountered when conducting this study was in the definition of the variables. By using population on the right hand side of the equation, bias was introduced causing the parameter estimates to be overestimated. Once population was taken into account, and the heteroskedasticity was addressed by using weighted least squares, the coefficient estimates more closely resembled those of the population. After adjusting for this, the achieved R^2's were smaller and more sensible. By eliminating some of the highly correlated variables from the equation, multicollinearity was reduced.

Some variables were omitted because they were unavailable at the time of the study. Some of the variables that should have been included in the equation were not very easily measured, e.s. patriotism. It is hard to measure how someone feels. Other variables that

could have been included in the equation could have been college benefits, medical benefits and retirement benefits.

V. CONCLUSIONS AND RECOMMENDATIONS

A.   CONCLUSIONS

The goal of this study was to lay the foundation upon which further research can be conducted. This is the first study to use military applicant data as a measure of supply It is also the first study to examine the impact of economic variables at the county-level.

This study found unemployment to be statistically significant and correctly signed in all three years for which regression models were estimated. All estimations of the Fixed Effects Model results were significant at all levels of significance, signifying that the unemployment rate at the county-level impacts recruiting the same way it does at a national level. One can also say that migration between counties does not include those individuals who are considered to be in the prime recruiting market.

The results of the education variable were surprising. It was thought that education would be a significant factor in what would drive individuals to pursue the military as a career. This may be due, in part, to the choice of variables to measure education. A better choice for an education variable would have been a measure of mother's education level. Inserting a variable to measure the military's education benefits may also have been a good choice to add to the model. This would be a good variable to add because not everyone can qualify for a scholarship, nor can every family afford to educate their children. This may be incentive enough for some individuals to apply to the military.

Labor force participation rate may have been a better choice to include in the model than population. Population includes everyone living in the country, whereas labor force

participation includes those actually employed in the labor market. Including population on the right hand side of the equation with race variables may have had an impact on their sign. All race variables were negative when they were predicted to be positive. One explanation for this sign reversal could be that these rate were not a true measure of the population, and their attitudes to the military. Culture may play a part or the small percentage of the race as a percent of the total population is small.

The variable used to measure black participation rate as a percentage of the general population also was not correctly signed. This was quite surprising because the military has been viewed as an equal opportunity employer.

B.   RECOMMENDATIONS

This section will discuss the recommendations of the author for further research. As was mentioned earlier, this was the first time a study of this nature was conducted. From this foundation, further research may be conducted.

The time frame covered by this model was relatively short. The type of regression model that was run was Ordinary Least Squares. Further research should attempt the following changes:

1. Construct a model with a dichotomous (1,0) dependent variable. This can be done if more information is obtained about those applicants who followed through with the decision to enlist. If this is done, the variable can be constructed in such a way so as to compare those individuals who applied and enlisted to those who applied but did not eventually enlist.

By doing so, one could further examine the local area characteristics that are correlated with a higher enlistment to applicant ratio. The military could use this information to target county recruiting areas.

2. Redefine independent variables as dummy variables. For example, counties across the nation vary in their unemployment rate. If one were to break the unemployment variable into categories of unemployment rate levels, one may be able to ascertain at what level more applicants see the military as an attractive alternative to being unemployed. This may be an effective way to locate future recruiting stations.

If the independent variables are defined as dummy variables, one may be able to determine at what level the variable is either not significant, or turns the sign contrary to what economic theory would predict. Also by creating a dichotomous dependent variable with dichotomous independent variables, one would be able to develop a reference case. By turning variables on and off, one could measure the impact of each factor on the binary outcome.

3. Conduct trend analysis. Migration is a big factor influencing the unemployment rate of an area. It might be interesting to know if an individual, especially in the category the military refers to as the prime recruiting market, would rather migrate to another area at that age instead of pursuing the military. It would also be interesting to know how a person's post-high school decisions to enter college are affected by the option to migrate or to pursue the military as an employer.

4. Examine the effects the economic variables have on the military's mental categories. Define the dependent variable as a dichotomous variable of whether the applicant is in the

upper mental category group. It may be that different explanatory variables have different impacts on the applicants depending on aptitude. Luckily the military has not had to lower its high recruiting standards in recent years, but it would be helpful to know what attracts a high quality youth to apply or even consider the military as a career. High quality is defined as the 50th percentile and above on the AFQT. A more interesting question might be--what is the mix of quality, and what are the factors that influence their decision to apply to the military the same against that level of quality as defined by Congress, DoD, and the military.

5. Include more variables. Variables that measure incentives to join the military as well a variables that influence applications should be added to the equation. An education variable that more specifically defines an individual's ability to score in this upper 50th percentile should be used as opposed to the median education level of those over 25 in 1980. Advertising is also a key player in motivating an individual to pursue the military as an employment option. Some measures of advertising at the county-level should be added.

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